AIRS First Light Clear FOV Detection

and Radiance Bias Analysis

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Introduction

Clear AIRS FOVs are identified by comparing the AIRS 2616 cm^{-1} super window channel with the forecast SST using -0.75K threshold for night ocean surface and by the 11 µm split window channels (900 and 1250 cm^{-1}) using threshold range of [-0.5, 0.5] for both day and night over the ocean surface. Radiance Bias are calculated for the resultant clear FOVs between AIRS observed radiance and the AVN simulated cloud-free radiance via AIRS_BT.

Background

- **Clear test used:**

    Night/Ocean -- $SST_{(2616cm-1)}$ - $SST_{(forecast)}$

    Night/Ocean -- $SST_{(11\mu m\ Split\ window)}$ - $SST_{(forecast)}$

    Day/Ocean   -- $SST_{(11\mu m\ Split\ window)}$ - $SST_{(forecast)}$
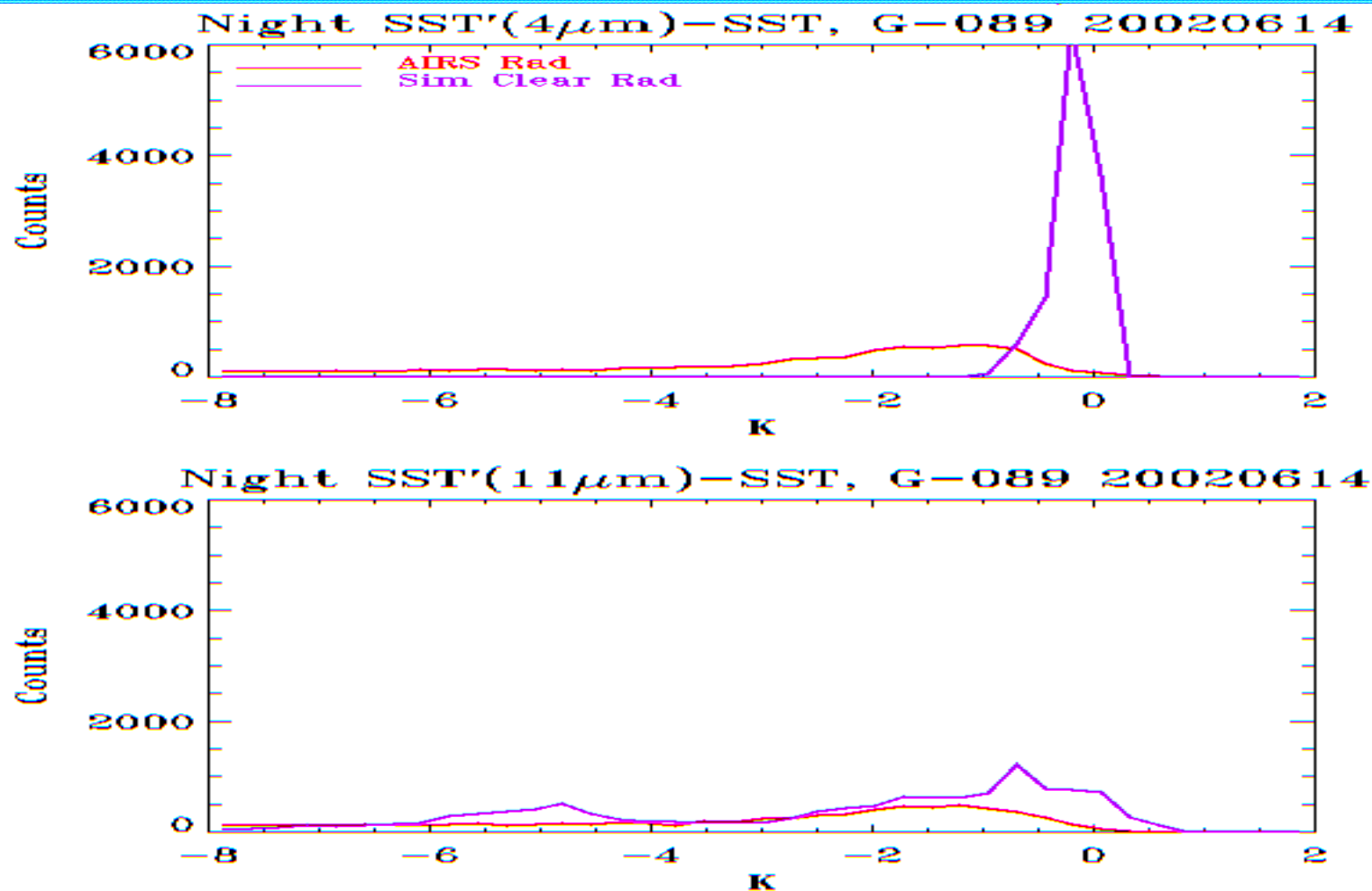
- **Data sets used:**

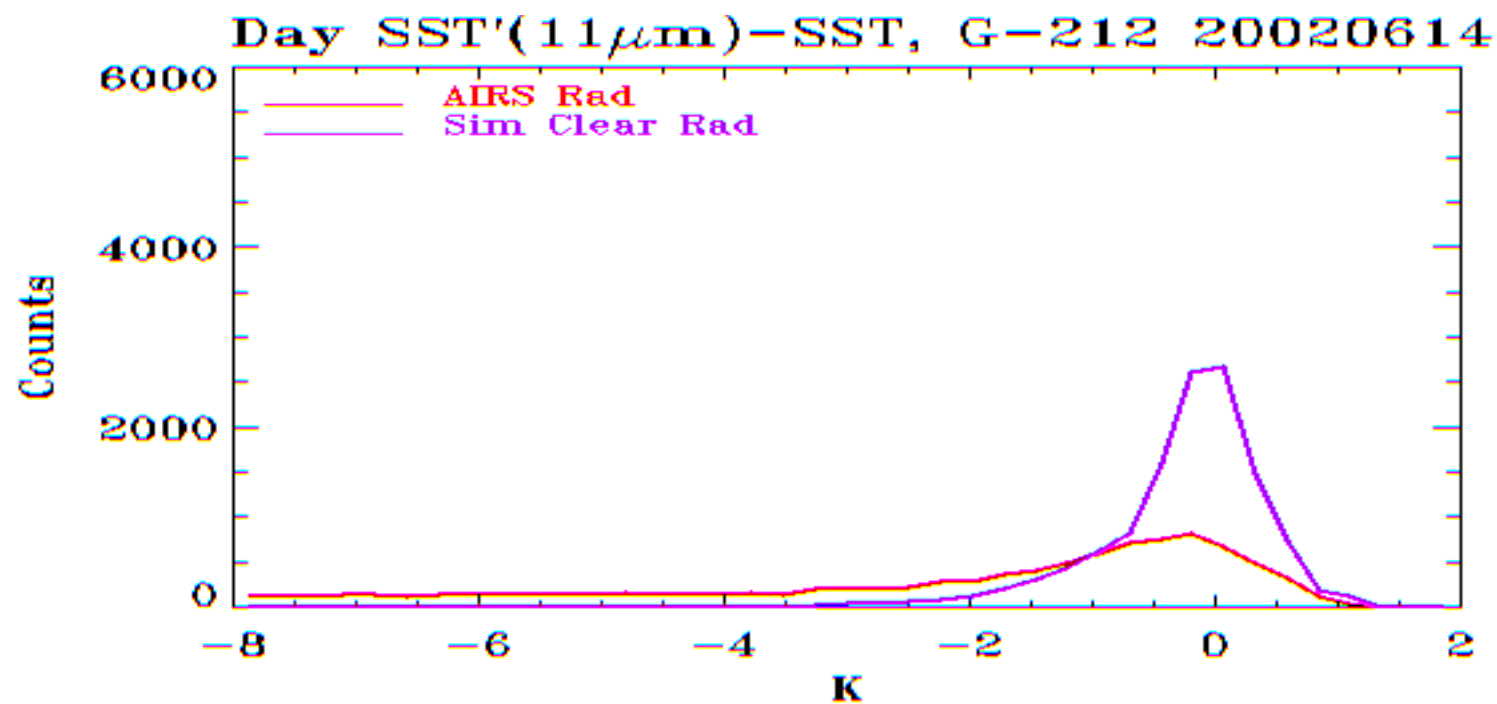   **6/14/2002 AIRS L1B radiance Granule 89 (night) and 212 (day)**

    AVN Simulated clear L1B radiance using AIRS_BT (V2_3_3)

Histogram Used to Determine
Threshold Values - Night

Night SST'(4μm)−SST, G−089 20020614

AIRS Rad
Sim Clear Rad

Night SST'(11μm)−SST, G−089 20020614

Histogram Used to Determine
Threshold Values - Day
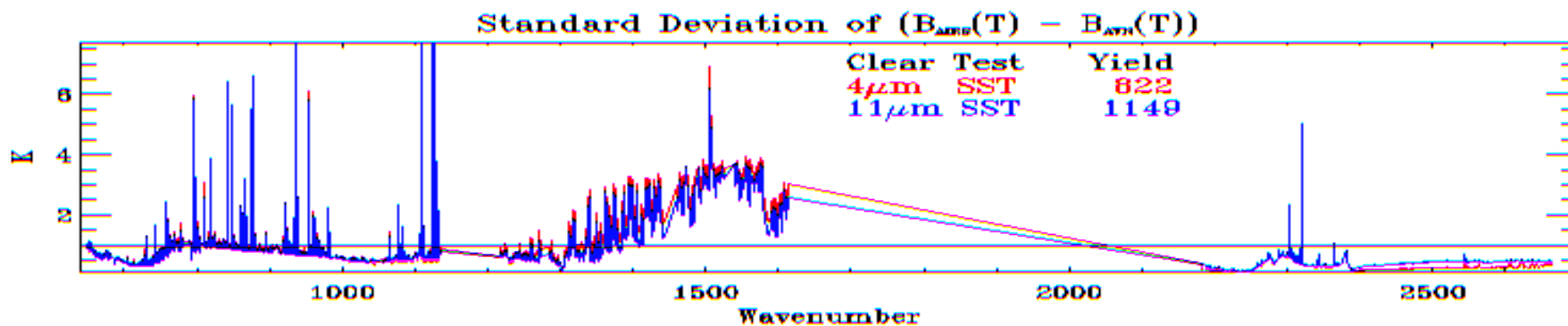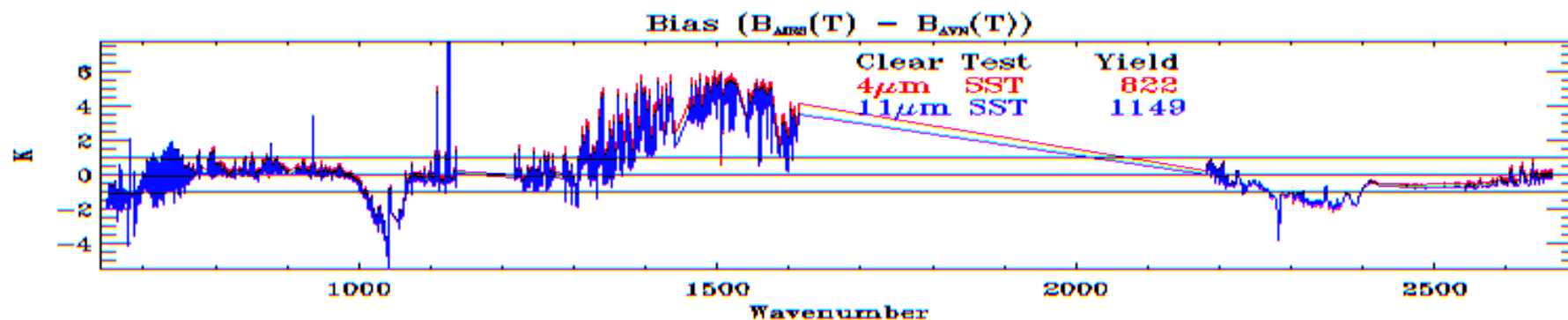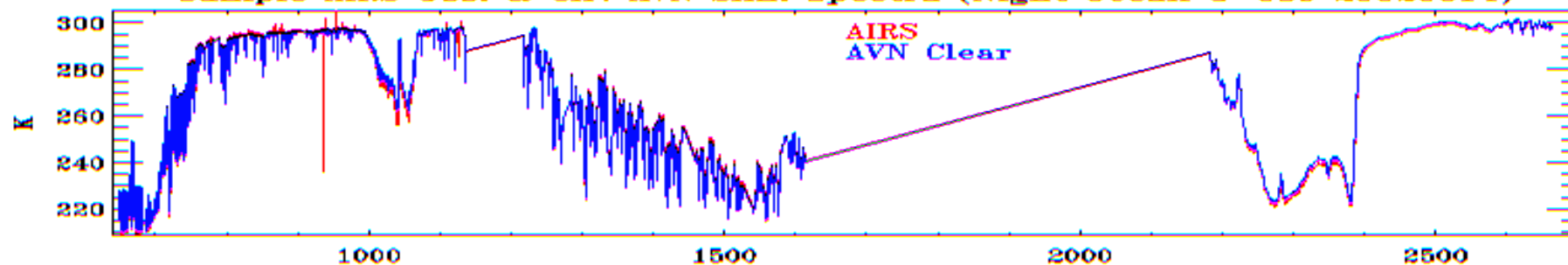

Day SST'(11μm)$-$SST, G$-$212 20020614

Sample Spectra/Bias/Std Dev - Night

Sample AIRS Obs. & Clr. AVN Sim. Spectra (Night Ocean G-089 20020614)
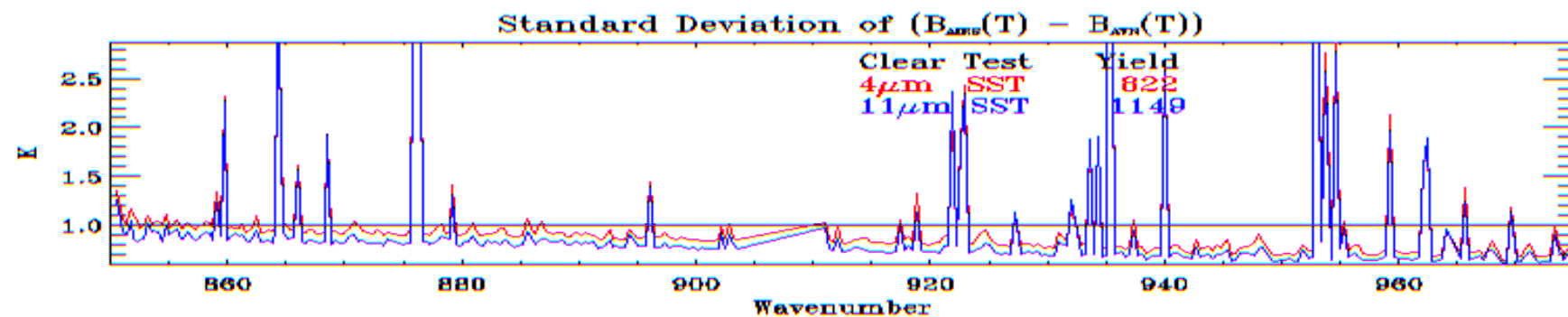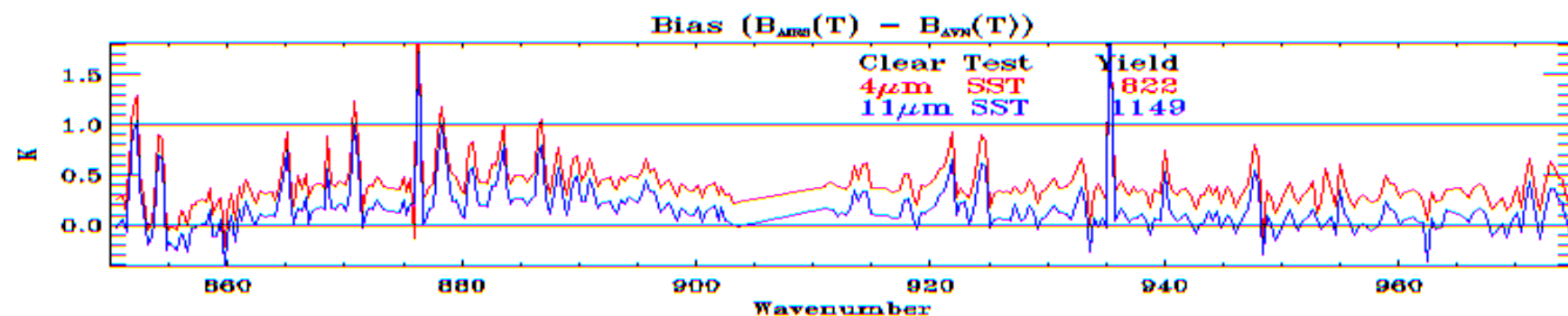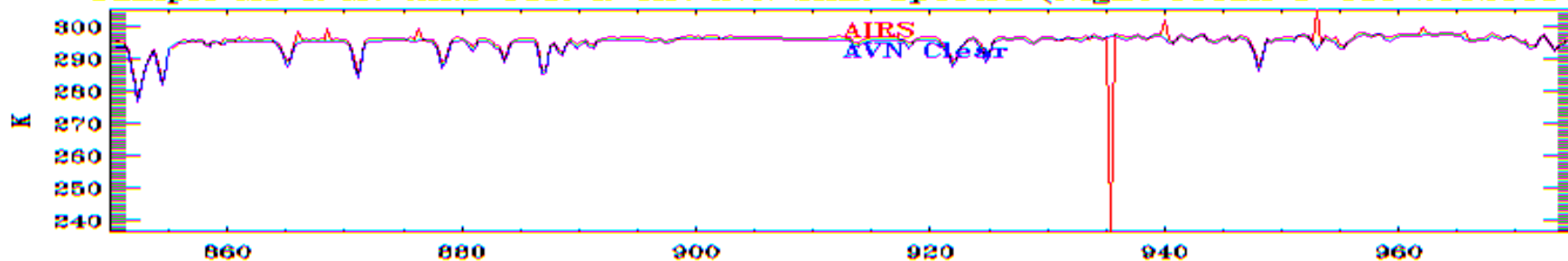
Sample Spectra/Bias/Std Dev - Night
Long Wave Window Region

Sample M8 & M7 AIRS Obs. & Clr. AVN Sim. Spectra (Night Ocean G-089 20020614)

Bias ($B_{AIRS}(T) - B_{AVN}(T)$)

Clear Test	Yield
4μm SST	822
11μm SST	1149

Standard Deviation of ($B_{AIRS}(T) - B_{AVN}(T)$)

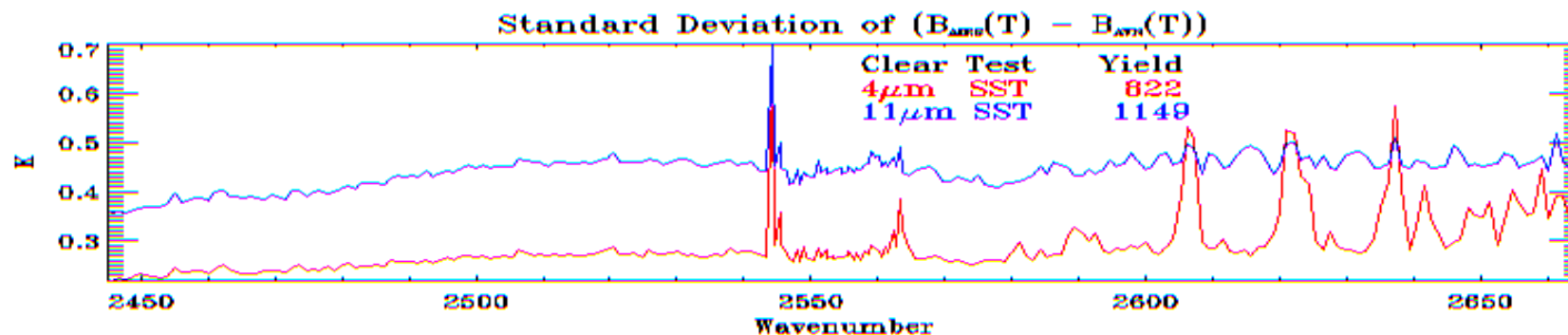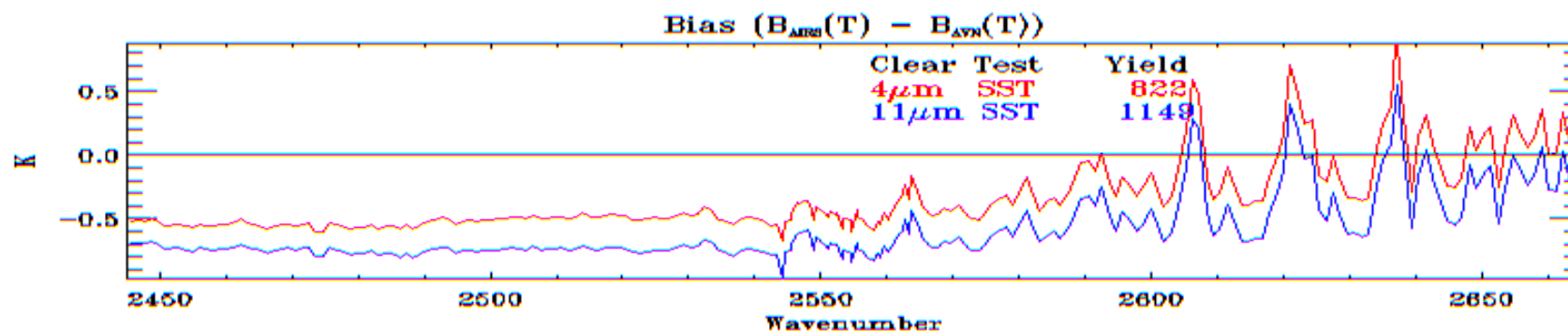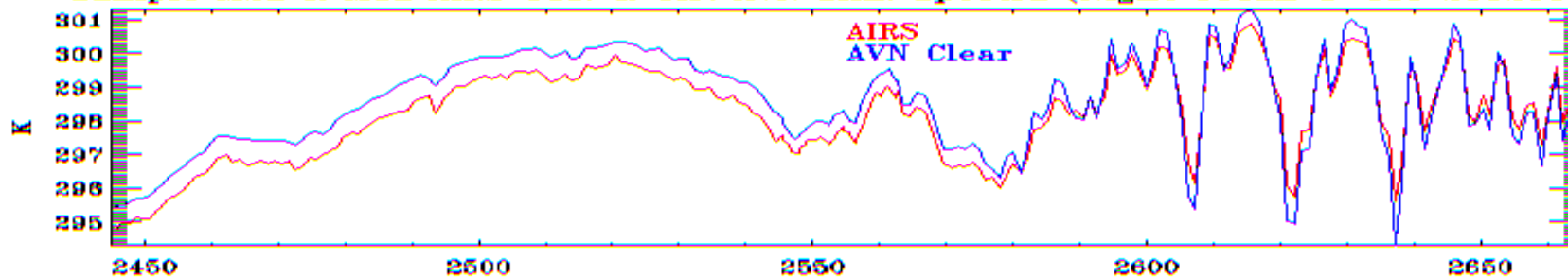| Clear Test	Yield
4μm SST	822
11μm SST	1149

Sample Spectra/Bias/Std Dev - Night
Short Wave Window Region

Sample M2a & M1a AIRS Obs. & Clr. AVN Sim. Spectra (Night Ocean G-089 20020614)

AIRS
AVN Clear

Bias ($B_{AIRS}(T) - B_{AVN}(T)$)

Clear Test		Yield
4μm	SST	822
11μm	SST	1149

Wavenumber

Standard Deviation of ($B_{AIRS}(T) - B_{AVN}(T)$)

Clear Test		Yield
4μm	SST	822
11μm	SST	1149

Wavenumber

Radiance Bias/Sdev
Based on Cloud Screening - Night

Cloud Screening & Rad. Bias Night Ocean G-089 20020614
AIRS FOVs PASSED both 4μm & 11μm SST Test, Yield: 534
AIRS FOVs PASSED 4μm but not 11μm SST Test, Yield: 288
AIRS FOVs PASSED 11μm but not 4μm SST Test, Yield: 615
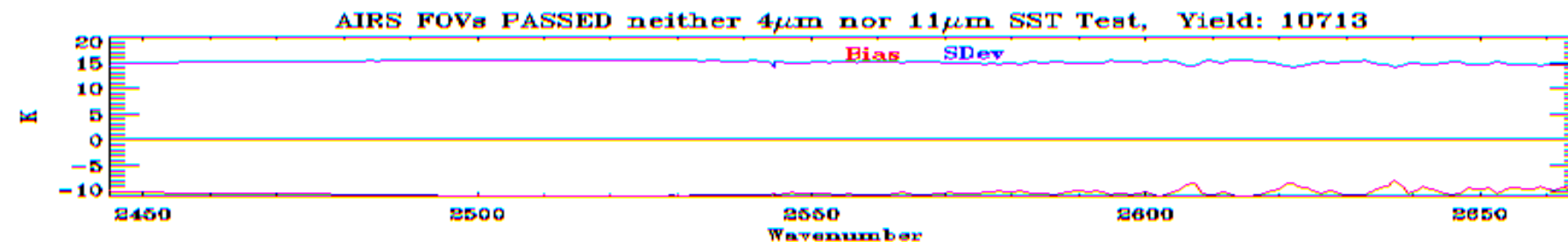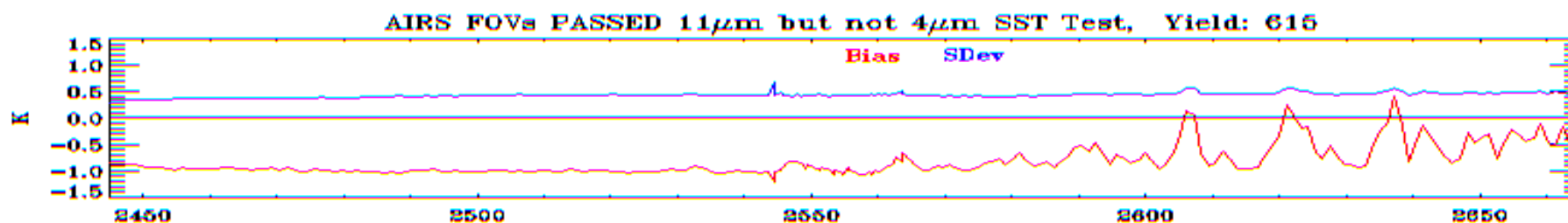AIRS FOVs PASSED neither 4μm nor 11μm SST Test, Yield: 10713

Long Wave Radiance Bias/Sdev
Based on Cloud Screening - Night

M8 & M7 Cloud Screening & Rad. Bias Night Ocean G-089 20020614

AIRS FOVs PASSED both 4μm & 11μm SST Test, Yield: 534

AIRS FOVs PASSED 4μm but not 11μm SST Test, Yield: 288

AIRS FOVs PASSED 11μm but not 4μm SST Test, Yield: 615

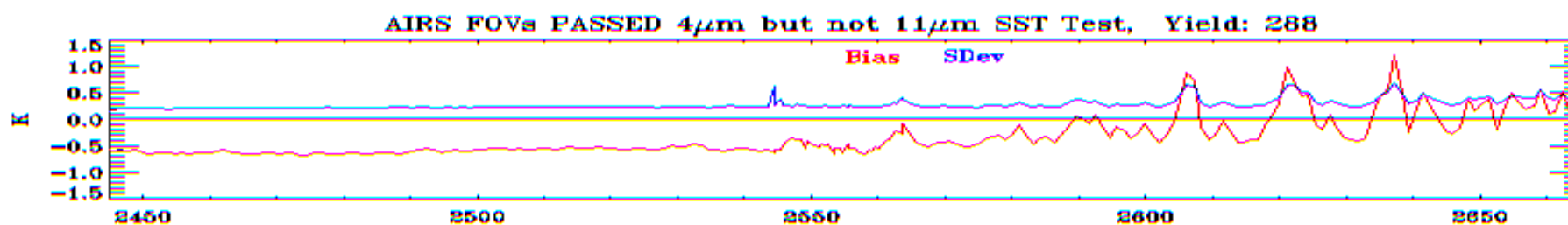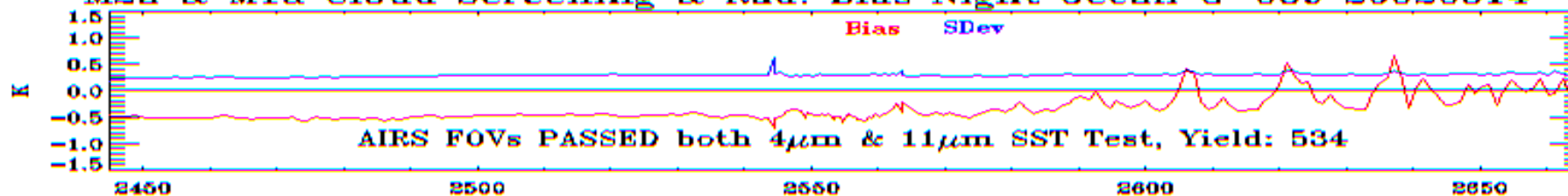AIRS FOVs PASSED neither 4μm nor 11μm SST Test, Yield: 10713

Short Wave Radiance Bias/Sdev
Based on Cloud Screening - Night

M2a & M1a Cloud Screening & Rad. Bias Night Ocean G-089 20020614

AIRS FOVs PASSED both 4μm & 11μm SST Test, Yield: 534

AIRS FOVs PASSED 4μm but not 11μm SST Test, Yield: 288

AIRS FOVs PASSED 11μm but not 4μm SST Test, Yield: 615

AIRS FOVs PASSED neither 4μm nor 11μm SST Test, Yield: 10713

Wavenumber

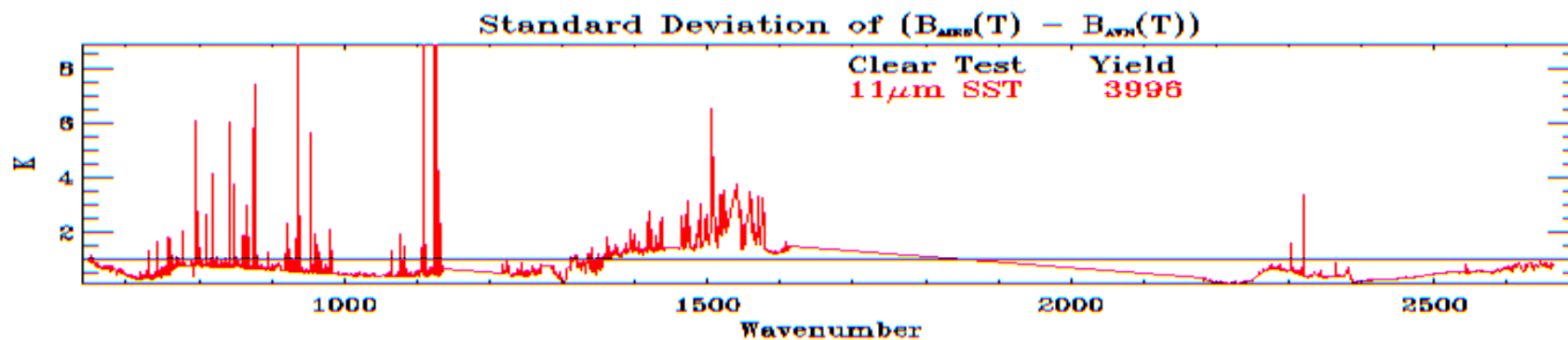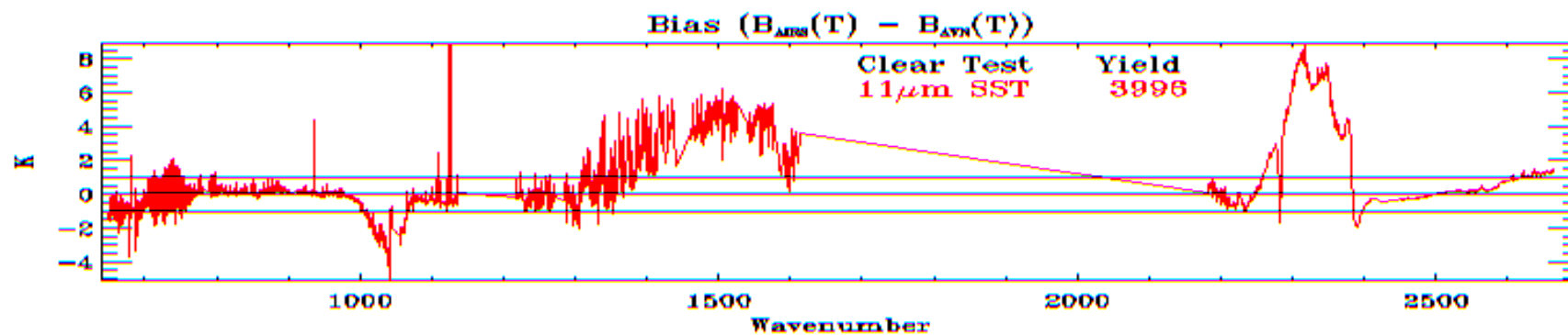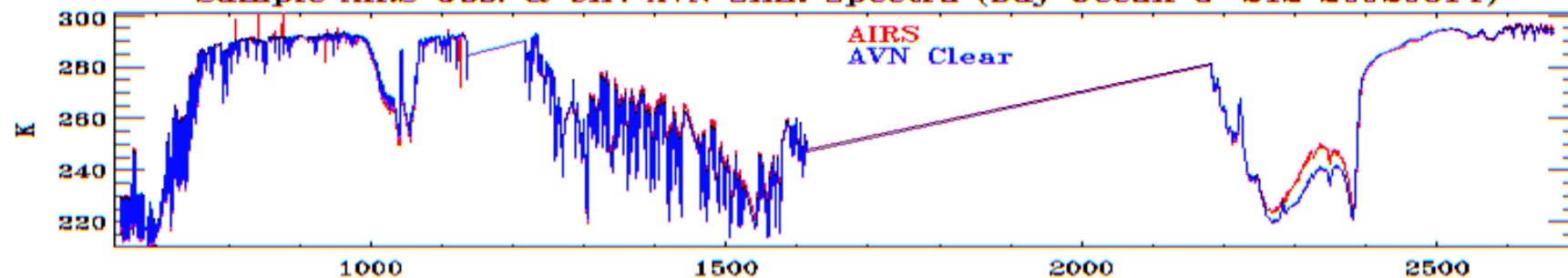# Sample Spectra/Bias/Std Dev - Day

Sample AIRS Obs. & Clr. AVN Sim. Spectra (Day Ocean G-212 20020614)

AIRS
AVN Clear

Bias ($B_{AIRS}(T) - B_{AVN}(T)$)

Clear Test   Yield
11μm SST   3996

Standard Deviation of ($B_{AIRS}(T) - B_{AVN}(T)$)

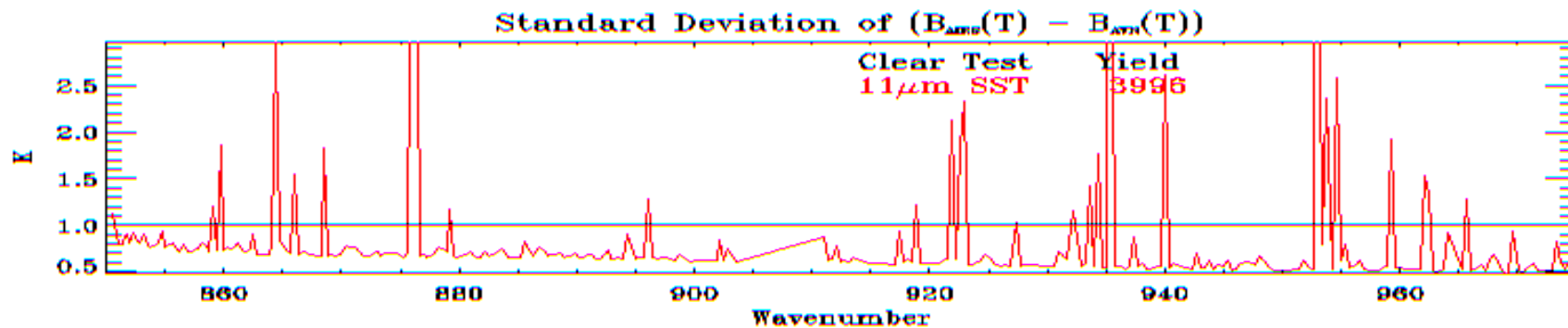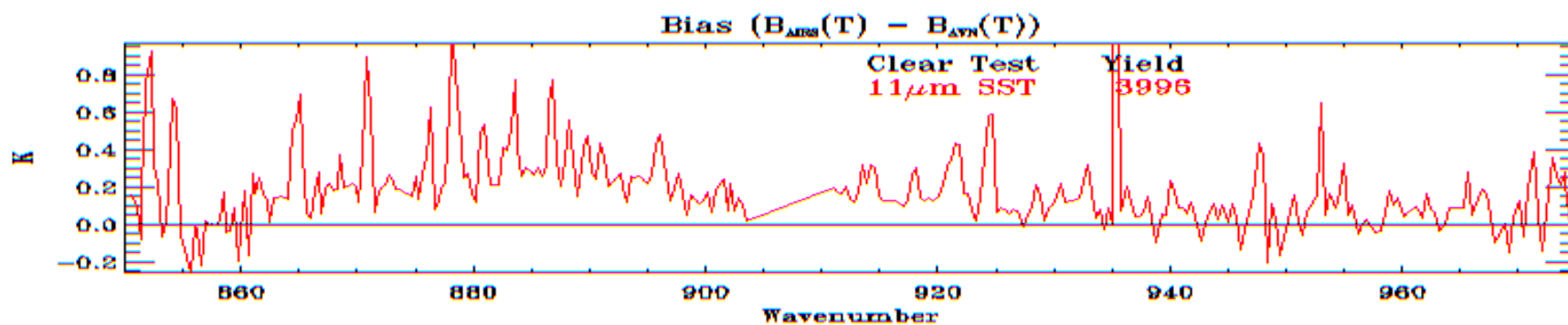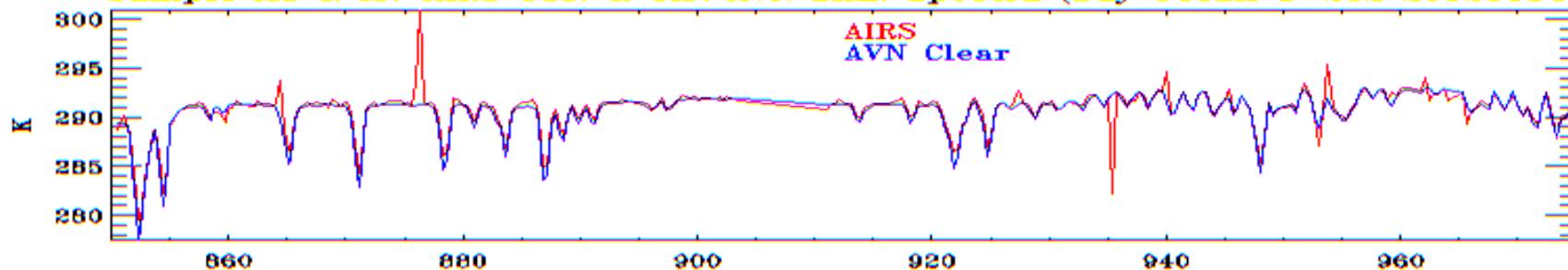Clear Test   Yield
11μm SST   3996

Sample Spectra/Bias/Std Dev - Day
Long Wave Window Region

Sample M8 & M7 AIRS Obs. & Clr. AVN Sim. Spectra (Day Ocean G-212 20020614)

AIRS
AVN Clear

Bias ($B_{AIRS}(T) - B_{AVN}(T)$)

Clear Test   Yield
11μm SST   3996

Standard Deviation of ($B_{AIRS}(T) - B_{AVN}(T)$)
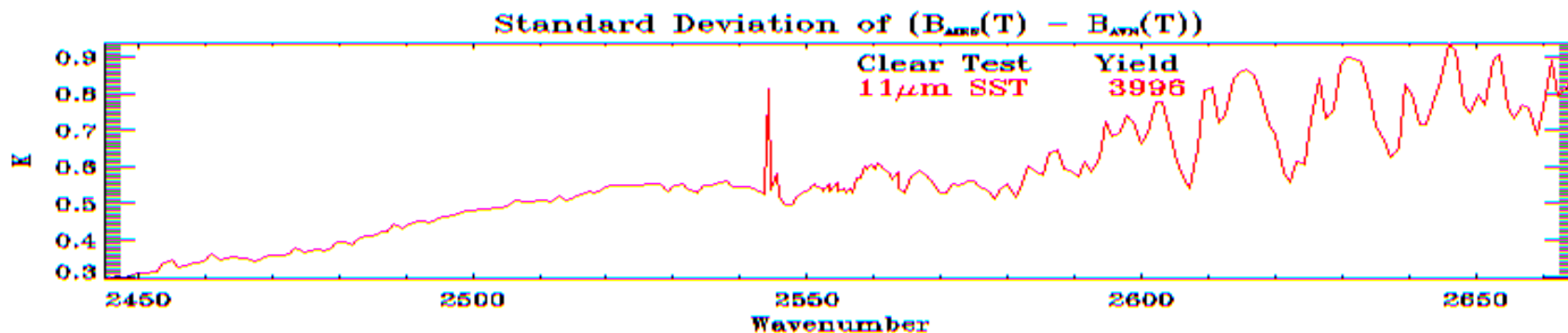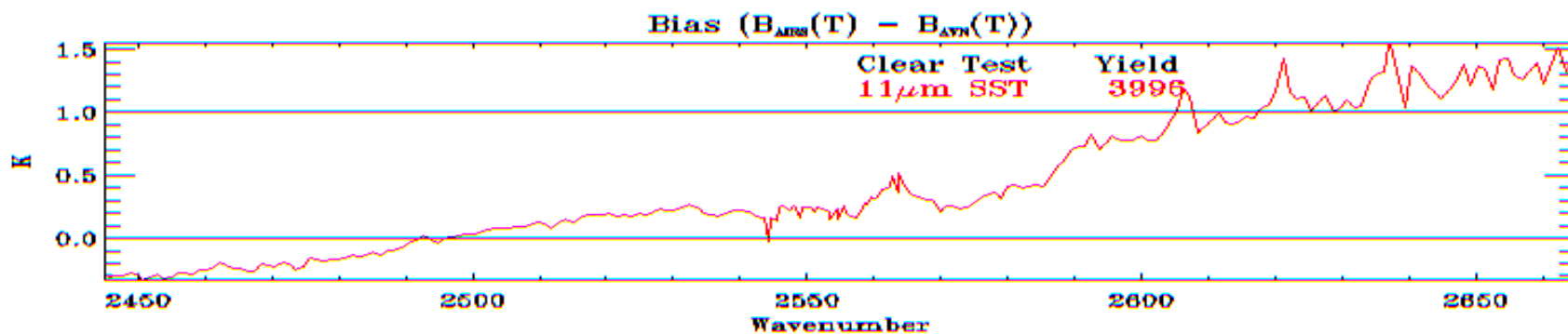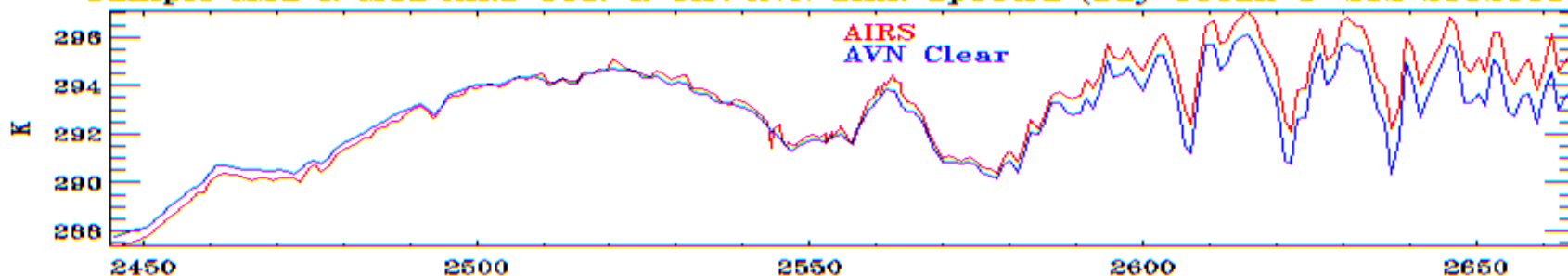
Clear Test   Yield
11μm SST   3996

Sample Spectra/Bias/Std Dev - Day
Short Wave Window Region

Sample M2a & M1a AIRS Obs. & Clr. AVN Sim. Spectra (Day Ocean G-212 20020614)
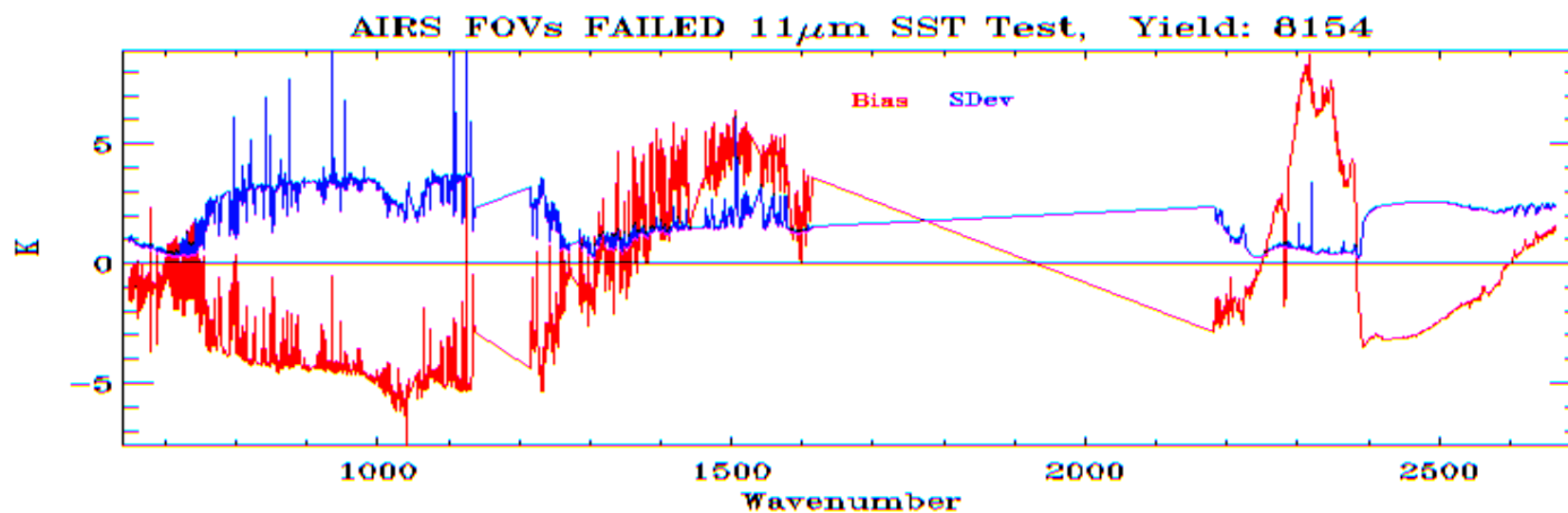
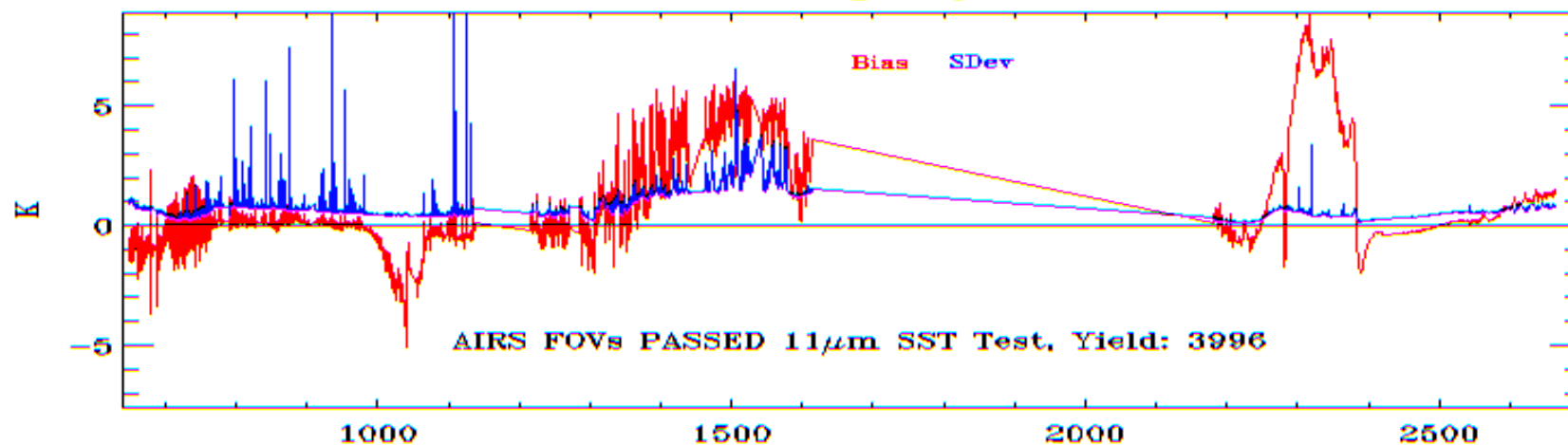# Radiance Bias/Sdev
Based on Cloud Screening - Day

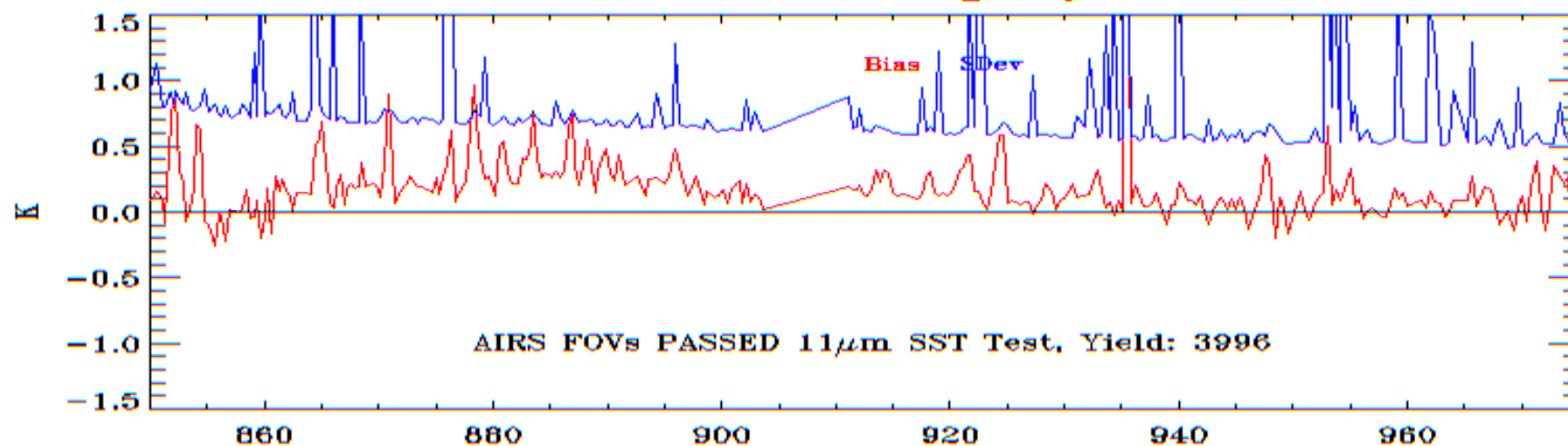Rad. Bias based on Cloud Screening, Day Ocean G-212 20020614

Bias   SDev

AIRS FOVs PASSED 11μm SST Test, Yield: 3996

AIRS FOVs FAILED 11μm SST Test,   Yield: 8154

Bias   SDev

Wavenumber

**Long Wave Radiance Bias/Sdev
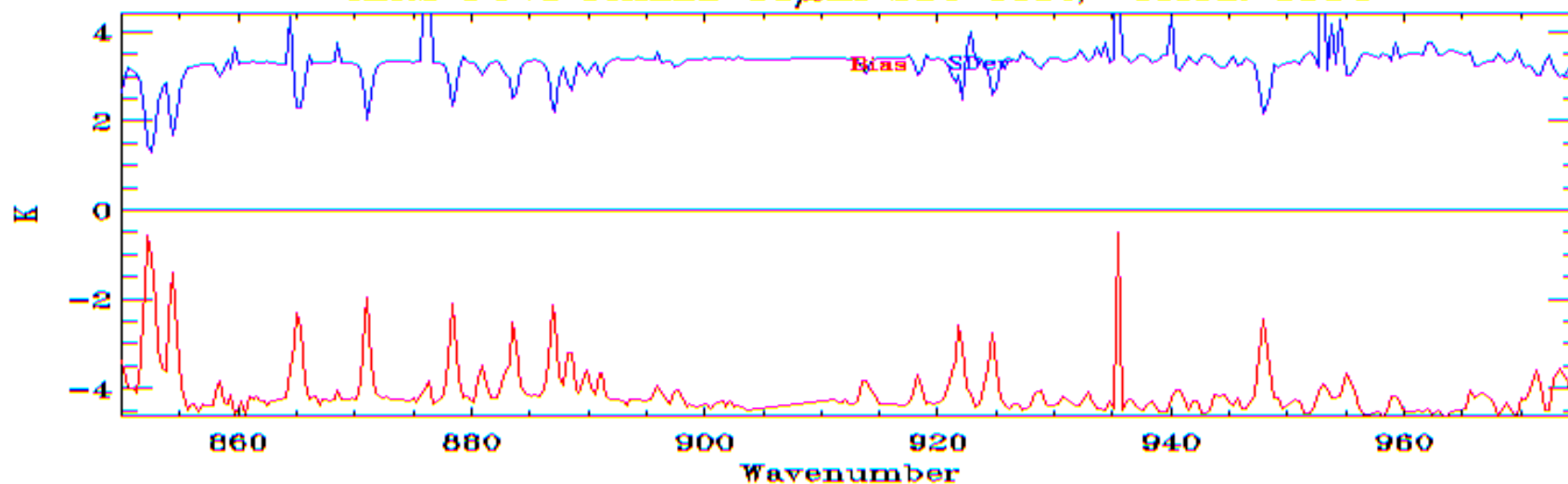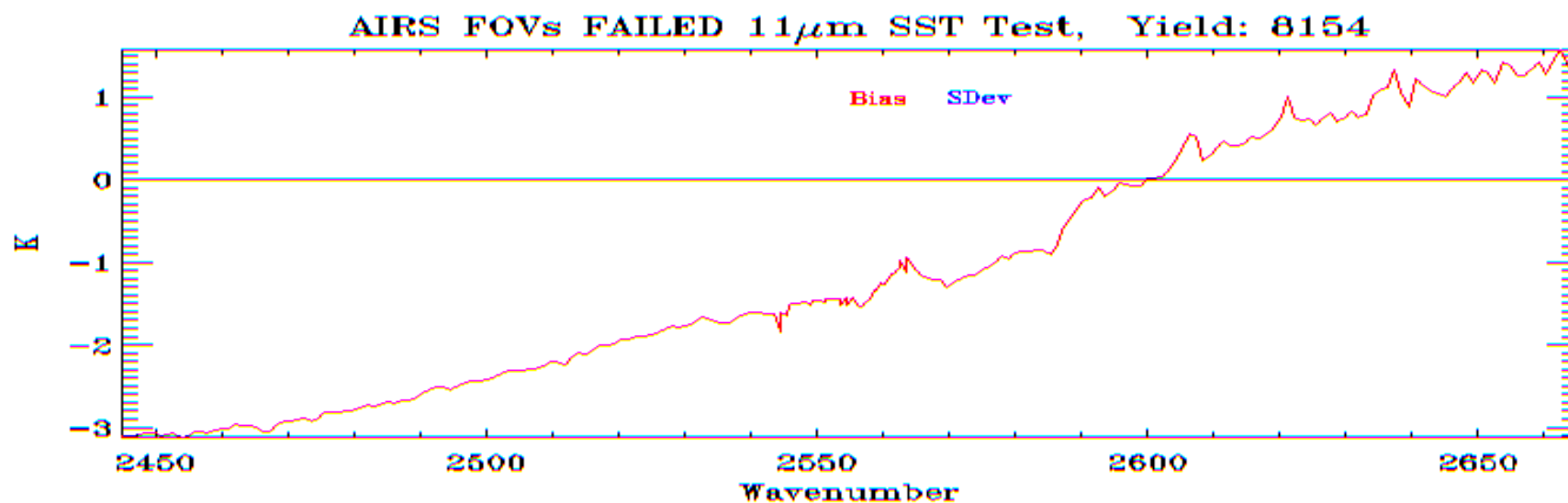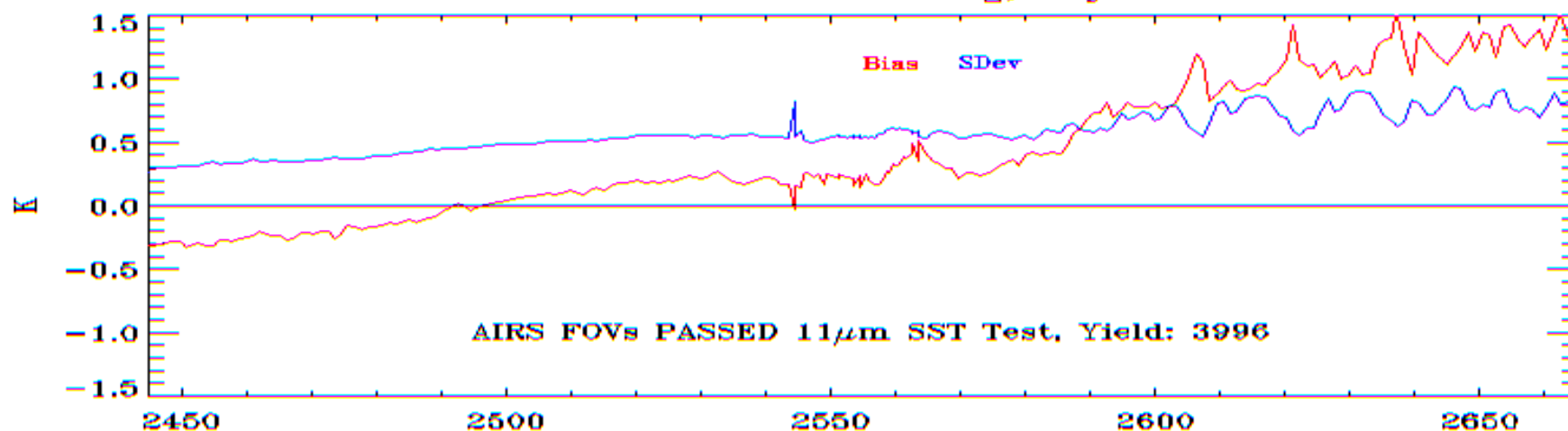Based on Cloud Screening - Day**

Short Wave Radiance Bias/Sdev
Based on Cloud Screening - Day

M2a & M1a Rad. Bias based on Cloud Screening, Day Ocean G–212 20020614

AIRS FOVs PASSED 11μm SST Test, Yield: 3996

AIRS FOVs FAILED 11μm SST Test, Yield: 8154

Clear FOV - **Ocean Night** (4μm Window SST Test)
(number in parentheses is % of clear out of all
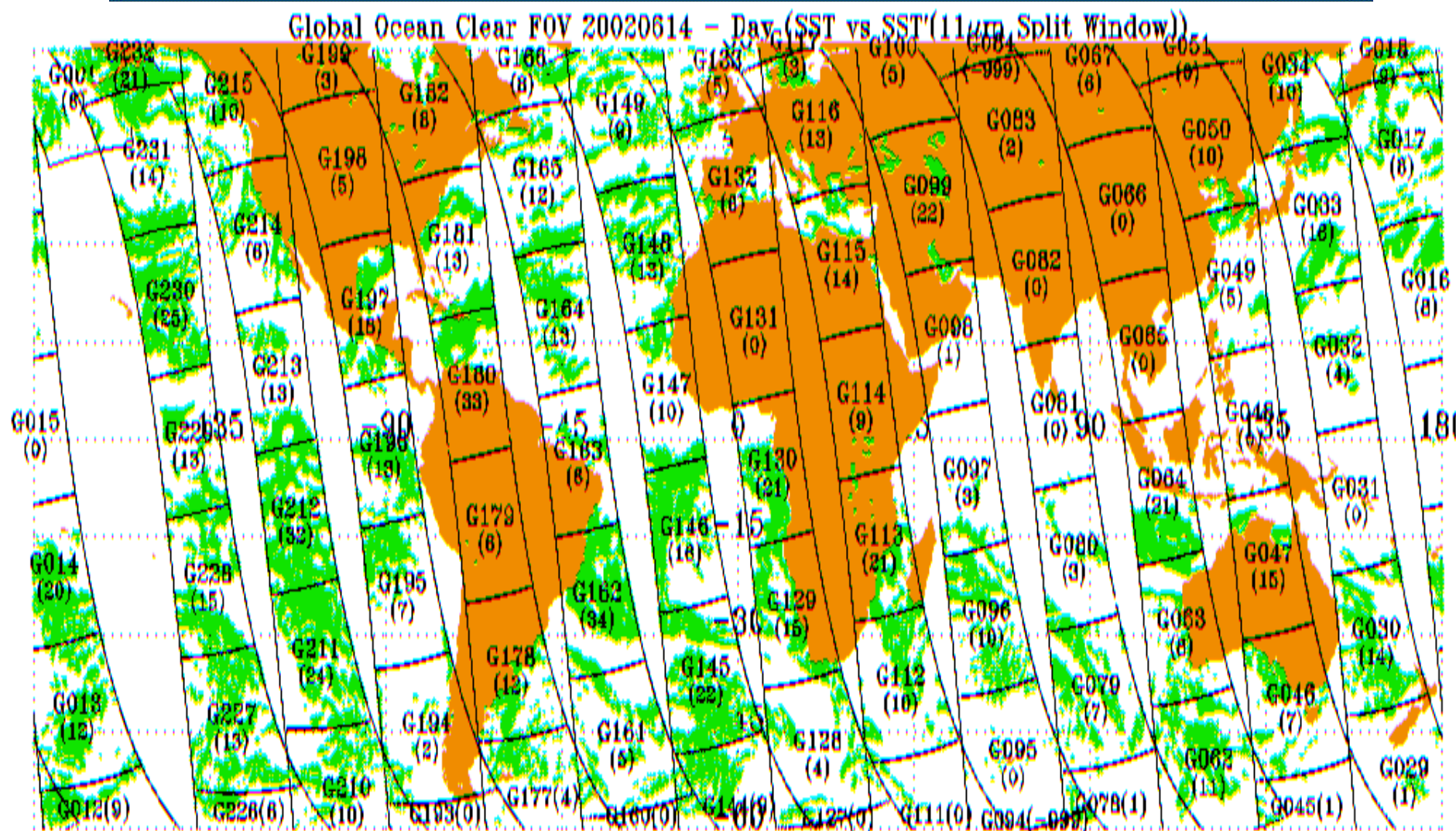ocean FOV within the granule)

Clear FOV - **Ocean Night** (11μm Split Window SST Test)
(% of clear out of all ocean FOV within the granule)
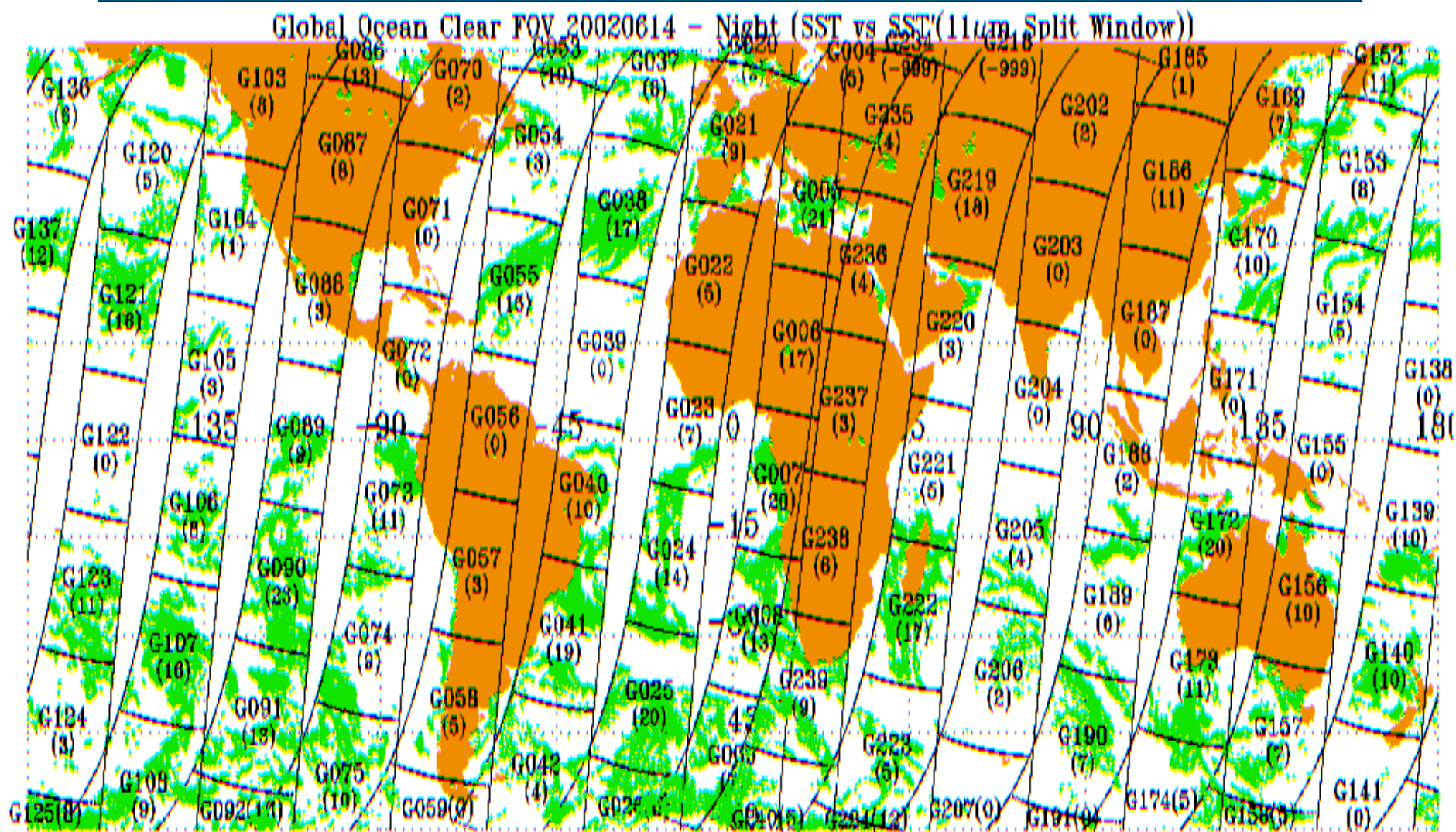
Clear FOV - **Ocean Day** (11um Split Window SST Test)
(% of clear out of all ocean FOV within the granule)

Initial Conclusions

- The 2616cm^{-1} SST test for night ocean and 11μm split window SST test for day ocean produce initial acceptable clear footprints which give radiance bias ~0.5K over the long and short wave window regions.

- Bias calculated from '.AND.' of both 2616cm^{-1} and 11μm split window show improvement of individual cases

- Agreement between clear FOVs detected by 11μm split window SST test and by the 2616cm^{-1} SST test for the NIGHT OCEAN condition may improve when the regression coefficients used to predict the SST values are updated.

- **Intermediate plan:**

  - Clear FOV detected by 11μm split window SST test for the DAY OCEAN condition will be compared with the VIS/NIR clear flags.

  - Clear FOV detected by 2616cm^{-1} SST test over NIGHT OCEAN will be compared with the fov_clear_flag and the final retrieval clear_flag.